



Illinois Department of Transportation

2300 South Dirksen Parkway / Springfield, Illinois / 62764

BDE PROCEDURE MEMORANDUM

NUMBER: 29-02

SUBJECT: Policy Resurfacing Program

DATE: July 1, 2002

This memorandum supercedes the information found in Section 53-4.02(a), 53-4.02(b), and 53-4.02(e) of the BDE Manual.

Background

The purpose of this memorandum is to set forth policy for appropriate bituminous concrete overlay thickness which will assist in achieving proper compaction and attaining the required density, thereby improving potential pavement performance.

Performance of bituminous concrete overlays in Illinois, especially on Interstates, is of concern. Second and third generation overlays exhibit shorter service lives than first generation overlays due to ever-increasing traffic levels and the inherent difficulties of accurately assessing the condition of the existing overlay and underlying pavement.

Lift thickness, density, and performance of bituminous concrete are all to a certain extent interrelated. Within the working limits of the compaction equipment, the thicker the lift, the easier it is to compact the mixture and meet density requirements. Larger volumes of materials allow for proper aggregate particle orientation, resulting in a more tightly packed aggregate structure and therefore, higher density pavement. Research in Illinois has shown that higher permeability can be directly correlated to lower density, and that the relationship is sensitive to aggregate size. This higher permeability results in bituminous concrete pavements that are subject to potential oxidation, moisture damage, and rutting problems. Superpave mixture design criteria, fully implemented by IDOT in 2001, indicates that the ratio of lift thickness to nominal top size aggregate should be at least 3:1. Surface course meets the Superpave mixture design criteria for lift thickness. Because of the higher traffic volumes of the interstates and the concern for increased service life, the Department sees increasing the binder thickness to meet the Superpave mixture design criteria for lift thickness as a benefit. The Department recognizes and accepts that the leveling binder thickness used on other State maintained highways may not always meet the Superpave requirements.

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Applicability

The following procedures are applicable to construction, reconstruction and rehabilitation projects on the state highway system, effective July 1, 2002.

Procedures

1. Interstates and Freeways Built Essentially to Interstate Standards

Current policy expects pavement rehabilitation projects on Interstates and freeways built essentially to Interstate standards to perform at least 8 to 10 years. Historical data and IDOT experience indicate that this policy will meet this performance period. With the implementation of Superpave mixture design criteria, the following guidelines will apply for determining the resurfacing thickness for Interstates and freeways:

- The standard policy resurfacing thickness for overlays on these highways will be 3.75 inches. This will allow for a 2.25 in. binder course lift and a 1.5 in. surface course lift.
- For second and subsequent resurfacings on Interstate highways and freeways, cold milling of the pavement should be considered to true up the pavement surface. The district will determine the feasibility of milling and the appropriate milling depth. Pavements with rutting depths greater than 0.50 in. should be investigated further to determine the cause of rutting. Greater milling depths may be required to completely remove badly rutted or unstable mixtures. Any failed patches should be replaced. Second resurfacings of "D" cracked pavements may warrant an additional resurfacing thickness. Contact BMPR and BDE for assistance in evaluating such situations.

Variations do exist within and between projects, and thicker overlays are sometimes required. Requests for additional thickness, or reduced thickness, should be submitted to BDE for approval. Approval will be contingent on supporting documentation.

- Structural Deficiency Exceptions: Pavements that meet any of the following conditions should be considered candidates for a 5 in. (a 3.5 in. binder course lift and a 1.5 in. surface course lift) overlay exception:
 - a. JRC pavements that exhibit medium to high levels of "D" cracking over at least 30% of the project and CRC pavements that exhibit low to medium levels of "D" cracking over at least 30% of the project;
 - b. JRC and CRC pavements with excessive total patching quantities which can be reduced by the additional overlay thickness;

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- c. JRC pavements with average faulting in excess of 0.5 in. (faults in excess of 0.75 in. should be patched); and/or
- d. JRC or CRC pavements with current traffic levels in excess of 7500 heavy commercial units per day.

2. Other State Maintained Highways

Current policy expects pavement rehabilitation projects on other State maintained highways to perform for at least 8 years. Historical data and IDOT experience indicate that, for the majority of previously resurfaced pavements, a 2.25 in. overlay will exceed the required performance period. Cold milling to remove rutting and similar pavement distress also should be considered.

- Standard resurfacing thickness calls for a 2.25 in. overlay. On those highways where the existing concrete has not been resurfaced, or where widening is being placed, the standard overlay thickness should be increased to 2.5 in. Projects should be designed to this criteria unless an exception can be justified.

Variations do exist within and between projects, and thicker overlays are sometimes required. Requests for additional thickness should be submitted to BDE for approval. Approval will be contingent on supporting documentation. Use the following guidelines to determine resurfacing thickness for other State maintained highways:

- Exception 1-Jurisdictional Transfer. Requests for additional resurfacing thickness will be approved only if the transfer is approved by the accepting agency. The amount of additional thickness should be held to a minimum that will allow the transfer to be accomplished. A field review conducted by the Pavement Review Team may be required for projects that include unusual or experimental treatments.
- Exception 2-Consistency. Projects that border on new or reconstructed sections with 15-year or greater design periods may qualify for additional thickness. Design the overlay for the same design period using the composite pavement design method that is presented in Chapter 54. Projects that contain an urban cross section with new curb and gutter also may qualify for additional thickness. Design the overlay for a 15-year design period using the composite pavement design method. Ensure that design calculations accompany any request to BDE. The figure below presents coefficients (based on average conditions) that may be used to evaluate new and old pavement materials at various periods to determine the thickness of the structural overlay required.

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STRUCTURAL COEFFICIENTS FOR FLEXIBLE PAVEMENT MATERIALS

STRUCTURAL MATERIALS	MINIMUM STRENGTH REQUIREMENTS			COEFFICIENTS		
	MS ^①	IBR	CS ^②	New Pavement	1st Resurfacing	2nd Resurfacing
Bituminous Surface				a	a'	a''
Road Mix (Class B)				0.20	0.15	0.11
Plant Mix (Class B)						
Liquid Asphalt				0.22	0.16	0.12
Asphalt Cement	900			0.30	0.23	0.17
Class I (1954 and before)				—	0.23	0.17
Class I (1955 and later)	1700			0.40	0.30	0.23
Superpave IL9.5 & IL 12.5 (4.0% voids)				0.40	0.30	0.23
Base Course				a₂	a₂'	a₂''
Aggregate, Type B						
Uncrushed		50		0.10	0.08	0.06
Crushed		80		0.13	0.10	0.08
Aggregate, Type A		80		0.13	0.10	0.08
Waterbound Macadam		110		0.14	0.11	0.09
Bituminous Stabilized	300			0.16	0.12	0.09
Granular Material	400			0.18	0.14	0.11
	800			0.23	0.17	0.13
	1000			0.25	0.19	0.15
	1200			0.27	0.21	0.16
	1500			0.30	0.23	0.17
	1700			0.33	0.25	0.20
Superpave Base Course				0.30	0.23	0.17
Superpave IL19.0 (4% voids)				0.33	0.25	0.20
Class I Binder	1700			0.33	0.25	0.20
Pozzolanic, Type A			600	0.28	0.22	0.16
Lime Stabilized Soil			150	0.11	0.09	0.07
Select Soil Stabilized with Cement			300	0.15	0.12	0.09
			500	0.20	0.15	0.11
Cement Stabilized Granular Material			650	0.23	0.17	0.13
			750	0.25	0.19	0.15
			1000	0.28	0.22	0.16
Subbase Course				a₃	a'	a''
Granular Material, Type B		30		0.11	0.09	0.07
Granular Material, Type A						
Uncrushed		50		0.12	0.10	0.08
Crushed		80		0.14	0.11	0.09
Lime Stabilized Soil			100	0.12	0.10	0.08

① Marshall Stability (MS) index or equivalent.

② Compressive strength (CS) in pounds per square inch (psi). For cement stabilized soils and granular materials, use the 7-day compressive strength that can be reasonably expected under field conditions. For lime stabilized soils, use the accelerated curing compressive strength at 120°F for 48 hours. For Pozzolanic, Type A, use the compressive strength after a 14-day curing period at 72°F.

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- Exception 3-Profile Corrections. Current policy requires a cross slope of 1.5% for new construction to promote cross drainage and prevent the ponding of water on the pavement surface. Most existing pavements constructed with circular crowns contain adequate cross slope to achieve this objective. For this reason, crown correction normally will not be required in resurfacing contracts. Where, due to uneven settlement or other reasons, a minimum cross slope of 1% is not available, first consider cold milling to obtain the proper crown. If cold milling is not feasible, prepare plans for crown correction using 1.5% cross slope for the required resurfacing thickness.
- Exception 4-Structural Deficiency. The following pavements may qualify for a 3.75 in overlay:
 - a. Pavements with severe base failures;
 - b. JRC and CRC pavements with excessive total patching quantities that can be reduced by the additional overlay thickness;
 - c. JRC pavements with average faulting in excess of 0.5 in.;
 - d. JRC, CRC, and overlaid concrete pavements exhibiting "D" cracking; and
 - e. Pavements with a current CRS rating of 3.9 and less.
- Exception 5-Heavy Traffic: Class I, II, and III primary highways with heavy traffic that have not been previously resurfaced will be eligible for additional resurfacing thickness as shown in the table below. The current ADT will be used for eligibility determination and should be submitted with the request. First and subsequent resurfacing projects for which substantial increases in traffic are expected (as in the case of detours) and projects for which commercial traffic travels fully loaded in one direction and empty in the other will be considered special cases and will be referred to BDE and BMPR for analysis.

MULTIPLE UNITS/DAY (2-way traffic)	EQUIVALENT THICKNESS OF EXISTING PCC SLAB (D_c)*	OVERLAY THICKNESS
MU < 500	All	2.5"
500 ≤ MU ≤ 1000	$D_c \leq 7.5"$	3.75"
	$D_c > 7.5"$	2.5"
1000 < MU ≤ 1500	$D_c \leq 8.5"$	3.75"
	$D_c > 8.5"$	2.5"
MU > 1500	All	3.75"

*NOTE: See Figure 54-6C of the BDE Manual for values of D_c .

2. Waterproofing and Surfacing of Bridge Decks

It is extremely difficult to obtain the desired density in the Superpave or Class I bituminous concrete surface course for lift thicknesses less than 1.75 in. because 0.5 in. of the overlay thickness will be reserved for the waterproofing membrane system (i.e., membrane plus sand asphalt protection layer). This would result in a thin lift of Superpave or Class I surface course remaining which cannot be compacted to the required density. The minimum Superpave or Class I surface course thickness that can be adequately compacted is 1.25 in. for a 9.5 mm or CA 16 mixture, and 1.5 in. for a 12.5 mm or CA 13 mixture. Therefore, for all projects on which plans are developed for waterproofing and surfacing bridge decks, specify a minimum 1.75 in. thick overlay for a 9.5 mm or CA 16 mixture or a minimum 2.0 in. thick overlay for a 12.5 mm or CA 13 mixture to adequately accommodate both the waterproofing membrane system and the Superpave or Class I surface course.

Engineer of Design and Environment

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